Water Operator Certification Examination 2002

CONVERSIONS, FORMULAS AND EQUATIONS

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CONVERSION FACTORS

LENGTH

1 inch (in. or ") = 2.54 centimeters (cm.)

1 foot (ft. or ') = 12 inches = 30.48 centimeters

1 yard (yd.) = 3 feet = 36 inches

1 meter (m.) = 39.37 inches = 3.28 feet = 1.094 yards

1 mile (mi.) = 1,760 yards = 5,280 feet

1 kilometer (km.) = 0.62 miles

AREA

1 square foot (sq. ft.) = 144 square inches (sq. in.)

1 square yard (sq. yd.) = 9 square feet

VOLUME AND CAPACITY

1 cubic foot (cu. ft.) = 7.48 gallons (gal.)

1 cubic yard (cu. yd.) = 27 cubic feet

1 quart (qt.) = 2 pints (pt.) = 32 fluid ounces

1 liter (l.) = 1000 milliliters (ml.) = 1.06 quarts

= 1000 cubic centimeters (cc.)

1 gallon (gal.) = 8 pints (pt.) = 231 cubic inches

= 3.785 liters = 3,785 milliliters

1 acre foot (ac. ft.) = 43,560 cubic feet = 325,829 gallons

WEIGHT

1 pound (lb. or #) = 16 ounces (oz.) = 7,000 grains (gr.)

= 453.6 grams (gm.)

1 kilogram (kg.) = 1,000 gm. = 2.205 pounds

1 ton (T.) = 2,000 lb.

1 gallon of water = 8.34 pounds

1 cubic foot of water = 62.4 pounds

1 liter of water = 1 kilogram or 1000 gram

1 milliliter of water = 1 gram

Density of water = 1 gm./ml. (1 gm./cc.), 8.34 lb./gal., or 62.4 lb./cu. ft.

Specific gravity of water = 1.00

TIME

1 minute (min.) = 60 seconds (sec.)

1 hour (hr.) = 60 minutes = 3600 seconds

1 day (d.) = 24 hours = 1,440 minutes = 86,400 seconds

1 week (wk.) = 7 days

1 year (yr.) = 12 months = 52 weeks = 365 days

TEMPERATURE

Degrees Fahrenheit = (9/5 x Degrees Centigrade) + 32   or +40 x 9/5 -40

Degrees Centigrade = (Degrees Fahrenheit - 32) x 5/9   or +40 x 5/9 -40

RATE OF FLOW

1 gallon per minute (gpm) = 1,440 gallons per day (gpd)

1 cubic foot per second (cfs) = 646,272 gpd = 448.8 gpm

1 million gallons per day (MGD) = 1.55 cfs = 694.4 gpm

1 MG = 1,000,000 gallons

CONCENTRATION

1 part per million (ppm) = 1 milligram per liter (mg/l)
                         = 0.0584 grains per gallon (gpg)
                         = 8.34 pounds per million gallons
                         = 1 pound of weight per million pounds

HYDRAULICS

2.31 head feet = 1.0 psi

0.433 psi = 1.0 feet head

PER CAPITA WATER USE

Gallons per capita per day = $\dfrac{\text{water used (gpd)}}{\text{total number of people}}$

PERCENT

Percent = $\dfrac{\text{Part}}{\text{Whole}}$ x 100

HORSEPOWER

1 horsepower = 550 foot-pounds per second

            = 33,000 foot-pounds per minute

            = 1,980,000 foot-pounds per hour

Water Horsepower = $\dfrac{\text{Q (flow in gpm) x H (head in feet)}}{3960}$

Brake Horsepower = Water Horsepower

Efficiency of Pump

Motor Horsepower = Brake Horsepower
                      Efficiency of Motor

EFFICIENCY

Efficiency % = output power
                 input power

POWER (ELECTRICAL)

Kilowatts (kW) = 0.746 x Motor Horsepower

FORMULAS

CT = Chlorine concentration in mg/L x time in minutes

Square Area = Length x Width

Circular Area = π r^2 (π = 3.14) **OR** Circular Area = 0.785 x D^2

Circumference = π D

Circular Volume = Area x Height

Square Volume = Width x Length x Height

Flow Rate (Q) = Velocity (ft/sec) x Area (ft^2) **OR** Q = A x V

Q = ft^3/sec flow rate

Force = Pressure (psi) x Area (in^2)

Chemical Dosage: **Lbs/Day** = MGD x ppm x 8.34 lbs./gal.

Detention Time = Tank Volume (Gallons)
                      Flow (gpm or gpd or GPH)

Filtration Rate (GPM/ft^2) = Flow (GPM)
                                    Surface Area (ft^2)

Surface Overflow Rate (GPD/ft^2) = GPD (flow)
                                          Tank surface area (ft^2)

Specific Capacity $\quad=\quad$ $\dfrac{\text{Flow (gpm)}}{\text{Drawdown (ft)}}$

Percent Strength by Weight $=\quad \dfrac{\text{Weight of Solute}}{\text{Weight of Solution}} \quad \text{x} \quad 100$

Weight of solution $=$ weight of solute $+$ weight of solvent

Dilution Formula $\quad$ **Volume Total x Concentration Total =** $V1C1 + V2C2$